

# Mentos Gone Wild!

## Lesson Overview

Learners become hooked on science when mentos candies are dropped into soda and cause a huge eruption. Learners will raise questions and design subsequent questions to test their ideas.



## Suggested Grade Levels: 3-6

## Standards for Lesson

Content Standard A: Science as Inquiry

Content Standard B: Physical Science

VA SOL:

3.1 a, c, j; 4.1 a, b, c; 5.1 g, h;

6.1 a, e, f, g, k; 6.5 a, b; LS.1 b, f, g, j;

PS.1 g, h, n; PS.2 a, c, d; PS.5 a;

## Time Needed

This lesson takes several class periods. Sample schedule:

Day One: Complete the **Engage** and **Explore** portion of the lesson

Day Two: Complete the **Explain** portion of lesson

Day Three: Complete the **Elaborate** and **Evaluate** portion of the lesson

## Materials for Lesson

- Fresh raisins
- Clear plastic cup
- Clear, carbonated soda (for example, Club Soda, Sprite or 7-Up)
- 13 Mentos – mint
- 2 liter Diet Coke

# Content Background

## Information for teacher:

This experiment is fun and exciting and really hooks students (and adults) interest into the science behind it. What keeps up more intrigued is that scientists still don't have a definitive answer. Experience chemists and physicists are still doing experiments to determine just what might be causing the eruption – is it chemical or physical change? Most would agree that it is physical.

Sodas contain sweeteners (sugar or artificial sweeteners), flavoring, water, and preservatives. Carbon dioxide (CO<sub>2</sub>) gas is added to the soda through a high pressure process that causes the gas to dissolve into the liquid. The CO<sub>2</sub> gas remains suspended in the liquid and can not expand to form more bubbles due to the high pressure. When a soda is opened, a whoosh can be heard as the pressure is relieved and the dissolved gas escapes. When the pressure is decreased, the suspended carbon dioxide gas nucleates to build up more bubbles. If you shake the soda, the gas takes some of the soda with it as it escapes the container.

Water molecules like each other and stick together. This is called cohesion and is due to the polarity in water molecules - similar to magnetism. The positive hydrogen atom in one water molecule is attracted to the negative oxygen atom in the next molecule. This strong attraction causes surface tension at the surface of a liquid and adhesion at the surface of another object. In soda, the water molecules cling together around the carbon dioxide (CO<sub>2</sub>) gas bubbles. Bubbles can't expand or form new bubbles unless this strong attraction between water molecules is weakened and the tension is broken.

When the Mentos are dropped into the soda, the gum arabic in the coating of the Mentos weakens the attraction of the water molecules around the CO<sub>2</sub> gas bubbles. As soon as the Mentos hit the soda, the carbon dioxide nucleates, or forms more bubbles, in the tiny, porous pits that are all over the Mentos surface. Couple this with the speed at which the Mentos are sinking to the bottom of the bottle and an eruptive blast occurs as the CO<sub>2</sub> is released and breaks free taking much of the liquid with it.

## Engage

Pour a glass of clear soda for each group of students and have student make observations. They should notice the bubbles that collect on the sides of the glass and come up from the bottom of the glass. Give students 5-6 raisins per team and have them make observations using a hand lens. Students should record observations, make drawings, and list some physical properties about both soda and raisins in their science notebook.

# Explore

Drop 5-6 raisins into the soda and watch what happens within the first few seconds. Do they float or sink? Continue watching for several minutes. Tell students to record observations.

Raisins are denser than the soda so they sink to the bottom at first. Sodas have bubbles of carbon dioxide gas. Bubbles collect on the rough surface of the raisins giving them buoyancy. Buoyancy means that something floats more easily. This lifts the raisins to the top of the liquid. At the surface the bubbles pop and escape into the air causing the raisins to lose their buoyancy and sink. More bubbles stick to the surface of the raisins and the process continues until most of the gas has escaped and the soda is flat.



# Explain

Tell the students that you are going to do an activity that is related to the dancing raisin activity that you did in the previous lesson. Students should think about what they learned and relate it to today's lesson. This activity should be done outside away from the building and other people. This is an activity because the students are not testing a question - they are just making observations.

1. Carefully open the bottle of soda and place the bottle on the ground or on a table where it will not tip over.
2. Open the whole roll of Mentos. Roll a piece of paper into a tube just big enough to hold the loose Mentos and stack them in the tube. Place an index card over the mouth of the soda bottle (the edge of the card should be at the lip of the opening). Then position the tube directly over the mouth of the bottle. The trick is to have all of the Mentos drop into the bottle of soda at the same time.
3. Ask student to make a prediction about what they think will happen when the Mentos drop into the container of soda. Tell them to think about what they learned in the previous lesson with the raisins. Students should record their predictions in their science notebook. Have students share their predictions with a partner.
4. Warn the spectators to stand back. Drop the Mentos into the container and back away quickly.
5. Have students record their observations. Students should share their observations with their team mates.
6. **THINK-PAIR-SHARE:** Ask students to record questions that they might have based on what they just observed and what they think might have caused the blast. After sharing, tell students that they will look at ways to answer those questions in the next lesson.

# Elaborate

Design an experiment to test how different variables affect the eruption of soda. Teachers will guide students to design their own experiment to test what affects the eruption. This experiment can be completed by the entire class or in small groups.

**THINK-PAIR-SHARE:** Using the 4-question design sheet, have students THINK about question one and record responses. After one minute, have students pair with their shoulder partner and **RALLY ROBIN** to compare and add answers. Then allow students share answers with the class. Some ideas that students might generate based on changing the materials include:

- Different brands or types of soda
- Diet vs. regular
- Diet soda with aspartame or Splenda
- Amount of soda
- Caffeine or Decaf
- Size of bottle
- Type of mentos – mint (matte finish) or fruit-flavored (glaze finish)
- Whole mentos vs. crushed mentos (more surface area)
- Number of mentos
- New mentos vs. used mentos
- Sand off mentos coating – Will the “naked” mentos have the same effect? If the sanded coating is dropped into the bottle, will it still cause an eruption?

# Evaluate

Experimental Design

Student Participation – Follow safety rules

# Observation Sheet



**What do you see with your eyes?**



**What do you smell with your nose?**



**What do you hear with your ears?**

## 4-Question Experimental Design Sheet

What did the soda do when the Mentos were added?

What materials would you need to have in order to conduct an experiment on \_\_\_\_\_?

What could you change about each material to affect how the \_\_\_\_\_?

If you change \_\_\_\_\_, what could you describe or measure to determine if \_\_\_\_\_ affects how \_\_\_\_\_?

### **3. Safety Sheet**

The following safety rules are to apply to this activity:

1. Roll up long sleeves and tie back long hair.
2. Wear safety goggles over your eyes.
3. When you adding Mentos to soda, point the open end away from yourself and others. Back away quickly.
4. Keep your work area clean and clear of materials.
5. Do not eat the Mentos or drink the soda!

## Safety Check-Off Sheet

Before you begin, check here to make sure you are ready for the activity:

- Are your sleeves rolled up?
- Long hair tied back?
- Do you have your goggles on?
- Did you point the open end of the bottle away from yourself and others when you added Mentos to soda?
- Did you back away quickly?
- Is your work area clean and clear of materials?